Claims:

What is claimed is

1. An adsorption unit comprising:

a first substrate layer;

an adsorbent layer disposed below the first substrate layer;

at least two electrodes in contact with at least one of said first substrate layer and said adsorbent layer;

a second substrate layer disposed below said adsorbent layer,

at least one via disposed through at least one of said first substrate layer, said adsorbent layer and said second substrate layer;

said at least one via being disposed between said at least two electrodes;

at least one collection port disposed through at least one of said first substrate layer, said adsorbent layer and said second substrate layer,

wherein said first substrate layer, said adsorbent layer and said second substrate layer are co-planar.

2. The adsorption unit of claim 1, further comprising at least one non-adsorbent microstructure material within said adsorbent layer.

3. The adsorption unit of claim 1, further comprising at least one manifold mechanism wherein said manifold mechanism performs at least one function of removing an adsorbed material, providing a feed stream, directing

materials toward said adsorption unit and directing material away from said adsorption unit.

4. The adsorption unit of claim 1, further comprising at least one of a coupled power source and a coupled multiphase signal generator.

5. The adsorption unit of claim 1 further comprising at least one of a coupled catalysts, a coupled catalyst layer, a coupled filter, and a coupled filter layer.

6. The adsorption unit of claim 1, wherein at least one of said first substrate layer and said second substrate layer is dielectric.

7. The adsorption unit of claim 1 wherein said electrodes generate at least one of a traveling electric field, a traveling electric wave, an electric field flux, a voltage spike, a multi-phase electromotive potential, an electric field gradient and combinations thereof.

8. The adsorption unit of claim 7, wherein said traveling electric field is continuous.

9. The adsorption unit of claim 7, wherein said traveling electric field is intermittent.

10. The adsorption unit of claim 1, wherein at least one of said first substrate layer and said second substrate layer comprises a heat dissipating material.

11. The adsorption unit of claim 1, wherein at least one of said first substrate material and said second substrate material comprise at least one

of a plastic material, an epoxy material, a glass materials, a silicon material, a dielectric material, a low thermal conductivity material, a fiberglass material and combinations thereof.

12. The adsorption unit of claim 1, wherein said electrodes contain at least one of a metal, a metallic alloy, a conductive plastic, a conductive resin, a doped material, a thorited tungsten material, a borium oxide plated material, a strontium oxide plated material and combinations thereof.

13. The adsorption unit of claim 1, wherein said adsorbent layer comprises more than one adsorbent material.

14. The adsorption unit of claim 1, wherein said adsorbent layer is macroporous.

15. The adsorption unit of claim 1, wherein said adsorbent of said adsorbent layer is suspended in a polymer matrix.

16. The adsorption unit of claim 1, wherein said adsorbent layer includes at least one of a desiccant, carbon, a carbon compound, graphite, a graphite compound, activated alumina, a molecular sieve, an aluminophosphate material, a silicoaluminophosphate material, an ion exchanged metal zeolites, hydrophilic zeolites, hydrophobic zeolites, modified zeolites, metal-ion exchanged zeolites, natural X type zeolites, modified X-type zeolites, faujasites, clinoptilolites, mordenites, metal-exchanged silico-aluminophosphates, uni-polar resins, bi-polar resins, aromatic cross-linked polystyrenic matrices, brominated aromatic matrices, methacrylic ester

copolymers, adsorbent carbonaceous materials, adsorbent graphitic materials, carbon fiber materials, nanotubes, nano-materials, adsorbent metal salts, perchlorates, oxalates, alkaline earth metals and combinations thereof.

17. The adsorption unit of claim 1, wherein said adsorbent layer further includes at least one binder material.

18. The adsorption unit of claim 1, wherein said adsorbent layer further includes at least one binder material of natural clays, calcined clays, modified clays, chemically treated clays, chemically modified clays, smecite clays, kaolin clays, sub-bentonite clays, kaolin-halloysite clays, kaolin-kaolonite clays, kaolin-nacrite clays, kaolin-anauxite clays, binary matrix materials, tertiary matrix materials, silica-thoria, silica-alumina-, silica-alumina-thoria, silica-alumina-zirconia, fibrous materials, colloidal silica materials, colloidal alumina materials, colloidal zirconia materials, colloidal mixtures, surface modified amorphous silicon dioxide nanoparticles, hydrated magnesium aluminum silicates, organic binder materials, inorganic binder materials, sintered binder materials, pyrolyzed binder materials, slurry-formed binder materials, vapor-deposited binder materials, cast binder materials, electro-sprayed binder materials, eletrophoretically deposited binder materials, extruded binder materials, laser deposited binder materials, electron beam deposited binder materials, silk-screened binder materials, photo-lithographically deposited materials, electrostatically self-assembled binder materials materials, LIGA-formed materials and combinations thereof.

19. The adsorption unit of claim 1, wherein said first substrate layer and said second substrate layer comprise at least one of fins, micro-grooves, vias, electrodes, buses and electrode connecting buses.

20. The adsorption unit of claim 1, said unit having at least one of a circular, square, rectangular, hexagonal, interleaved linear, octagonal, spiral repeating polyhedral and repeating geodesic shape.

21. The adsorption unit of claim 1, said electrodes having at least one shape of a circular, square, rectangular, hexagonal, octagonal repeating polyhedral and repeating geodesic shape.

22. The adsorption unit of claim 1, wherein at least one of said first substrate layer, said adsorbent layer and said second substrate layer is bonded to at least one other layer.

23. The adsorption unit of claim 1, wherein said adsorption unit is a non-swing type adsorption

24. An adsorption unit, comprising:

a first substrate layer;

an adsorbent layer disposed below the first substrate layer;

at least two electrodes in contact with at least one of said first substrate layer and said adsorbent layer;

a second substrate layer disposed below said adsorbent layer,

at least one via disposed through at least one of said first substrate layer, said adsorbent layer and said second substrate layer, said at least one via being disposed between said at least two electrodes;

at least one collection port disposed through at least one of said first substrate layer, said adsorbent layer and said second substrate layer;

a third substrate layer disposed over at least one of said first substrate layer and said adsorbent layer; and

a working fluid,

wherein said first substrate layer, said adsorbent layer and said second substrate layer are co-planar; and

wherein placement of said third substrate layer above said first substrate layer defines a chamber; and wherein said working fluid is recycled within said adsorption cell.

25. The adsorption unit of claim 24, further comprising at least one non-adsorbent microstructure material within said adsorbent layer.

26. The adsorption unit of claim 24, further comprising at least one manifold mechanism wherein said manifold mechanism performs at least one function of removing an adsorbed material, providing a feed stream, directing materials toward said adsorption unit and directing material away from said adsorption unit.

27. The adsorption unit of claim 24, wherein at least one of said first substrate layer, said second substrate layer and said third substrate layer is dielectric.

28. The adsorption unit of claim 24, wherein said electrodes generate at least one of a traveling electric field, a traveling electric wave, and voltage field flux, a voltage spike, a multi-phase electromotive potential, an electric field gradient and combinations thereof.

29. The adsorption unit of claim 28, wherein said traveling electric field is continuous.

30. The adsorption unit of claim 28, wherein said traveling electric field is intermittent.

31. The adsorption unit of claim 24, wherein at least one of said first substrate layer, said second substrate layer and said third substrate layer comprises a heat dissipating material.

32. The adsorption unit of claim 24, wherein at least one of said first substrate material, said second substrate layer and said third substrate material comprise at least one of a plastic material, an epoxy material, a glass materials, a silicon material, a dielectric material, a low thermal conductivity material, a fiberglass material and combinations thereof.

33. The adsorption unit of claim 24, wherein said electrodes contain at least one of a metal, a metallic alloy, a conductive plastic, a conductive resin,

a doped material, a thorited tungsten material, a borium oxide plated material, a strontium oxide plated material and combinations thereof.

34. The adsorption unit of claim 24, wherein said adsorbent layer comprises more than one adsorbent material.

35. The adsorption unit of claim 24, wherein said adsorbent layer is macroporous.

36. The adsorption unit of claim 24, wherein said adsorbent of said adsorbent layer is suspended in a polymer matrix.

37. The adsorption unit of claim 24, wherein said adsorbent layer includes at least one of a desiccant, carbon, a carbon compound, graphite, a graphite compound, activated alumina, a molecular sieve, an aluminophosphate material, a silicoaluminophosphate material, an ion exchanged metal zeolites, hydrophilic zeolites, hydrophobic zeolites, modified zeolites, metal-ion exchanged zeolites, natural X type zeolites, modified X-type zeolites, faujasites, clinoptilolites, mordenites, metal-exchanged silico-aluminophosphates, uni-polar resins, bi-polar resins, aromatic cross-linked polystyrenic matrices, brominated aromatic matrices, methacrylic ester copolymers, adsorbent carbonaceous materials, adsorbent graphitic materials, carbon fiber materials, nanotubes, nano-materials, adsorbent metal salts, perchlorates, oxalates, alkaline earth metals metallic particles and combinations thereof.

38. The adsorption unit of claim 24, wherein said adsorbent layer further includes at least one binder material.

39. The adsorption unit of claim 24, wherein said adsorbent layer further includes at least one binder material of natural clays, calcined clays, modified clays, chemically treated clays, chemically modified clays, smecite clays, kaolin clays, sub-bentonite clays, kaolin-halloysite clays, kaolin-kaolonite clays, kaolin-nacrite clays, kaolin-anauxite clays, binary matrix materials, tertiary matrix materials, silica-thoria, silica-alumina-, silica-alumina-thoria, silica-alumina-zirconia, fibrous materials, colloidal silica materials, colloidal alumina materials, colloidal zirconia materials, colloidal mixtures, surface modified amorphous silicon dioxide nanoparticles, hydrated magnesium aluminum silicates, organic binder materials, inorganic binder materials, sintered binder materials, prolyzed binder materials, slurry-formed binder materials, vapor-deposited binder materials, cast binder materials, electro-sprayed binder materials, eletrophoretically deposited binder materials, extruded binder materials, laser deposited binder materials, electron beam deposited binder materials, silk-screened binder materials, photo-lithographically deposited binder materials, electrostatic self-assembled binder materials, LIGA-formed materials and combinations thereof.

40. The adsorption unit of claim 24, wherein said first substrate layer and said second substrate layer comprise at least one of fins, micro-grooves, vias, electrodes, buses and electrode connecting buses.

41. The adsorption unit of claim 24, said unit having at least one of a circular, square, rectangular, hexagonal, octagonal repeating polyhedral and repeating geodesic shape.

42. The adsorption unit of claim 24, said electrodes having at least one shape of a circular, square, rectangular, hexagonal, interleaved linear, spiral, octagonal repeating polyhedral and repeating geodesic shape.

43. The adsorption unit of claim 24, wherein at least one of said first substrate layer, said adsorbent layer, said second substrate layer and said third substrate layer is bonded to at least one other layer.

44. The adsorption unit of claim 24, wherein said working fluid comprises at least one refrigerant.

45. The adsorption unit of claim 24, wherein said working fluid comprises at least one of a halocarbon compound, a cyclic-organic compound, a azeotropic compound, an aliphatic hydrocarbon compound, an oxygen-containing compound, a nitrogen-containing compound, a sulfur-containing compound, an inorganic compound, an unsaturated organic compound, a gaseous compound and combinations thereof.

46. The adsorption cell according to claim 24, further comprising a heat sensor disposed within at least one of said first substrate layer, said second substrate layer and said third substrate layer.

47. A method for separating materials, comprising the steps of:

introducing a plurality of substances to at least one adsorbent material;

adsorbing at least one substance of said plurality of substances;

electrically charging the adsorbent material so as to generate a traveling electric field; and

removing said at least one adsorbed substance from the at least one adsorbent material.

48. The process of claim 47, further comprising the step of filtering said plurality of substances.

49. The process of claim 47, further comprising the step of exposing said plurality of substances to one of an electro-positive or an electro-negative material.

50. The process of claim 47, further comprising the step of exposing said plurality of substances to a catalyst material.

51. The process of claim 47, further comprising the step of collecting said at least one removed substance.

52. The process of claim 47, wherein said electric field is one of a traveling electric field, an electric field flux, a voltage spike, a polyphase electric potential, an electric field gradient and combination thereof.

53. The process of claim 47, further comprising at least one of the steps of allowing any non-adsorbed substances of said plurality of substances to be removed from the adsorption unit, collecting any non-adsorbed substances of

said plurality of substances, recycling any non-adsorbed substances of said plurality of substances and subjecting any non-adsorbed substances of said plurality of substances to at least one additional purification step

54. The process of claim 47, further comprising the step of polarizing at least one of said substances of said combination of substances.

55. The process of claim 47, wherein said plurality of substances is at least one of a gas, a liquid and mixtures thereof.

56. The process of claim 47, wherein said process is approximately non-thermal.

57. The process of claim 47, wherein said process is exothermic.

58. The process of claim 47, wherein said process is endothermic.

59. The process of claim 47, wherein at least one of said plurality of substances is oxygen, air, water, p-xylene, o-xylene, a hydrocarbon, an aromatic hydrocarbon, a heavy metal, a virus, a bacterium, a pathogen, a volatile organic compound, a salt, a vapor, a gas, a liquid and a particle.

60. A process for thermal management, comprising the steps of:

exposing a working fluid to at least one adsorbent unit;

electrically charging said adsorbent material so as to generate a traveling electric field;

adsorbing said working fluid within said adsorbent layer;

condensing said adsorbed working fluid from said adsorbent layer;

removing said adsorbed working fluid from said adsorbent layer;

and

re-exposing said working fluid to said adsorbent unit.

61. The process of claim 60, wherein said adsorbent unit is a closed adsorbent unit.

62. The process of claim 60, further comprising the step of collecting said removed working fluid from said adsorbent layer.

63. The process of claim 60, wherein said working fluid is at least one of a refrigerant, of a halocarbon compound, a cyclic-organic compound, a azeotropic compound, an aliphatic hydrocarbon compound, an oxygen-containing compound, a nitrogen-containing compound, a sulfur-containing compound, an inorganic compound, an unsaturated organic compound, a gaseous compound and combinations thereof.

64. The process of claim 60, wherein said step of exposing said working fluid to said adsorbent unit is at least one of pumping a gas feed stream, pumping a liquid feed stream, passing a gas feed stream, passing a liquid feed stream, opening a gas feed stream, opening a liquid feed stream and combinations thereof.